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This invention relates generally to fasteners and particularly to fasteners of the type which, in use, are driven into a support structure with the aid of an explosively powered tool. Such fasteners are commonly known as "powder actuated" fasteners.

Many standard types of fixing brackets are used in association with powder actuated fastener studs. Such brackets may, for example, have curved portions to receive conduits or be shaped to provide suspension points for suspended ceiling panels or wall partitions but in each case the bracket has a flat fixing plate portion through which a powder actuated stud is driven. It is customary in these circumstances to place the bracket in location, and then position a stud loaded power tool against the bracket and drive the stud through the bracket into the support member. This procedure has been found most time consuming, and, at times, most awkward particularly where the point of affixment of the bracket is relatively inaccessible. In order to alleviate some of the difficulties associated with this procedure a guard (hereinafter referred to as a "bracket guard") for the end of the fixing tool has been developed to hold the bracket in operable relation to the tool. There are various forms of bracket guards available and most work on the same general principle that they allow a stud to be inserted in the appropriate place in the fixing tool and allow the base plate of the bracket to register in an appropriate station built into the guard to position the base plate with respect to the stud. The base is usually held in position by means of springs or magnets or other arrangements. Thus the arrangement allows the stud to be positioned appropriately

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in the fixing tool with the clip held in the bracket guard so that the tool can be pressed against the point of affixment and then activated. There are regulations governing the use of powder actuated fixing tools and most require that the tool be firmly held against the work piece in a perpendicular direction thereto so that the stud will not ricochet off when actuated. The bracket guards are so designed that the base plate of the clip is placed flush with the work surface at the point of affixment prior to firing so that the tool and guard comply with the regulations. Some fixing tools have inbuilt safety mechanisms to ensure that they can only be fired if the tool is perpendicular to the work surface and the bracket guard can be used satisfactorily with these because the base plate of the bracket is arranged to be flush with the work surface.

Where the fixing tool is to affix great numbers of brackets, the separate steps of placing the stud in the tool then registering the bracket in the station in the bracket guard contribute significantly to the time expended.

By the invention described in Australian patent application No. 56620/73 the brackets and fasteners can be pre-assembled and the resulting assemblies can be fitted to conventional bracket guards to simplify the firing procedure considerably. In that case, however, the pre-assembly technique requires an additional component in the form of a collar which is force fitted to the tip of the fastener stud to hold the stud to the bracket and which either shatters or yields when the fastener stud is actuated. The present invention provides a modification by which the need for additional component is avoided and the assembly

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procedure itself can be simplified.

According to the invention there is provided a fastener assembly for use in fastening an object to a support structure, which assembly is comprised of a bracket including a flat fixing plate portion having at least one straight side and a flange portion extending from said one side of the fixing plate portion to stand outwardly of one face of the fixing plate portion at said one side of the fixing plate portion, and a powder actuatable fastener stud having a head, a shank and a tip, wherein the bracket further comprises a stud holding portion formed integrally with the fixing plate portion to project outwardly of said one face of the fixing plate portion and defining an aperture with which the shank of the stud is engaged with a friction fit whereby the stud is held with its shank perpendicular to the fixing plate portion and its head spaced outwardly from said one face of the fixing plate portion so that, on actuation of the fastener stud, the stud head will engage the stud holding portion of the bracket which is formed to yield under the impact of that engagement, whereby the stud can be driven by powder actuation into a flat support surface to hold the fixing plate portion flat against that surface and so anchor the flange portion in a position in which it extends out from the support surface beyond the fixing plate portion and the stud head.

The stud holding portion of the bracket may be in the form of a generally cylindrical collar pressed out of the fixing plate portion of the bracket so as to extend perpendicularly from it. In this case the collar may

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yield on impact with the stud head by splaying outwardly to form a bead or rim between the stud head and the fixing plate portion of the bracket. Preferably, however, the stud holding portion of the bracket is formed as a dished or bowed plate portion with the aperture extending through it at the apex of the dish or bow so as to grip the stud shank at a position spaced outwardly of said one face of the fixing plate portion, the dished or bowed plate part collapsing on impact with the stud head. Specifically the stud holding portion of the bracket may comprise a U-shaped strip raised out of the fixing plate portion of the bracket.

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The fastener stud may be held by the stud holding portion of the bracket such that its tip is generally flush with the face of the fixing plate portion of the bracket opposite to said one face.

In order that the invention may be more fully explained two particular embodiments of it will be described with reference to the accompanying drawings in which :-

Figure 1 is an exploded perspective view of a fastener assembly constructed in accordance with the invention;

Figure 2 is a cross-section through the fastener assembly of Figure 1;

Figure 3 is a cross-section through the same fastener assembly after affixment to a support structure;

Figure 4 is a perspective view of a conduit clip which may be incorporated in an assembly in accordance with the invention;

Figure 5 is an exploded perspective view of a fastener assembly having an alternative, and presently preferred, type of stud holding portion pressed out of the fixing plate of the bracket;

Figure 6 is a cross-section through the assembly of Figure 5;

Figure 7 is a cross-section through the assembly of Figure 5 after affixment to a support structure; and

Figure 8 is a perspective view of a conduit clip incorporating the same type of stud holding means as the assembly of Figures 5 to 7.

The fastener assembly shown in Figures 1 to 3 comprises a bracket 11, a powder actuated stud 12 and a stud retaining sleeve¹³. Bracket 11 has a flat fixing plate portion

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14 and a functional portion 16. The functional portion 16 may take a variety of forms. It may be a flat flange perpendicular to the fixing plate portion and provided with a hole 17 to receive a bolt as shown in Figure 1 or it may be a curved flange 16A as in the conduit clip shown in Figure 4, or it may have some other specialized shape.

The stud 12 has a head 19, a shank 21 and a pointed tip 22 and a stud holding portion 23 is pressed and deep drawn out of the flat fixing plate portion 14 of bracket 11 to engage the shank 21. Stud holding portion 23 in the form of a generally cylindrical collar which defines a central aperture 24 and which projects outwardly from one face 25 of the flat fixing portion of the bracket. The shank 21 of stud 12 is engaged with aperture 24 with a friction fit so that the stud is firmly held with its shank perpendicular to the fixing plate 14, its head 19 adjacent the face 25 of fixing plate portion and its tip 22 generally flush with the reverse face 26 of the fixing plate portion.

Stud retaining sleeve 13, which is of conventional construction, is positioned on the shank of the stud between the stud head 19 and the stud holding portion 23 of the bracket. It has resilient flanges which slide in and frictionally engage the barrel of a fixing tool to retain the stud within the barrel. When the tool is activated sleeve 13 disintegrates under the impact of the stud head and falls away. The stud head will then engage the outer end of the stud holding collar 23 of the bracket.

The assembly of Figures 1 and 2 can be used with a conventional driving tool fitted with the normal clip guard. The fixing plate portion 14 of the bracket sits within the

guard and is held by the normal retaining clips and the stud projects back into the barrel of the driving tool. The periphery of sleeve 13 engages the barrel bore to retain the stud therein. The driving tool is pressed against a support structure to which the bracket is to be fastened and is activated to drive the stud into the support structure. Stud head 19 is of only slightly less diameter than the barrel bore and thereby guides the stud during driving. Sleeve 13 disintegrates under the impact of head 19 which then engages the stud holding collar 23 of the bracket. Collar 23 is soft enough to yield under the impact of the stud head by splitting and splaying out over the bracket fixing plate 14 to form a bead on the upper face 25 of the fixing plate which serves as a seat for the stud head. The fixture thus formed is illustrated in Figure 3 in which the support structure is denoted as 15 and the bead as 23A.

The assembly illustrated in Figures 5 to 7 is generally similar to that of Figures 1 to 3 and like parts have been identified by the same numerals. In this case however, the stud holding portion 23 of the bracket is in the form of a bowed rectangular strip pressed out of the bracket fixing plate 14 with the aperture 24 disposed at the apex of the bow. The stud holding portion may most conveniently be formed by piercing a flat bracket flange to form the aperture 24 and then raising the strip to the U-shaped bow as illustrated. In the use of the assembly the U-shaped strip 23 collapses on impact with the stud head in the manner indicated in Figure 7 which shows the completed fixture to a support structure 15.

Figure 8 illustrates a conduit clip from which a

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U-shaped strip has been pressed to serve as a stud holder in the similar fashion to the bracket of the assembly shown in Figures 4 and 5.

In the illustrated constructions pre-assembly of a fastener stud and fixing bracket is achieved without the need for an additional component as in the case of the assemblies of Australian patent application no. 56620/73 and the assembly procedure itself is slightly simplified. The U-shaped stud holding strip of Figures 5 to 8 and to a lesser extent the integral bracket collar of Figures 1 to 4, also provides a certain amount of cushioning to the fastener, particularly when the tool is overcharged by the operator, hence contributing to a more effective fix. However, the illustrated embodiments of the invention have been advanced by way of example only and many modifications and variations could be made to them. For example a stud holding means similar to that of Figures 5 to 8 can be achieved by a dished plate portion rather than a bowed portion. More specifically a dome or dimple could be pressed out of the fixing plate flange of the bracket. Again, sleeve 13 may, if desired, be omitted, the stud being retained in the tool bore by, for example, magnetic attraction. In instances where the head 19 of the stud is too small in relation to the tool bore to ensure proper guidance by the head during fixing the sleeve may be of metal or hard plastics, for example, and of a form such as to provide such guidance. Accordingly it is understood that the invention is in no way limited to the details of the illustrated embodiments and that many modifications and variations will fall within the scope of the appended claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A fastener assembly for use in fastening an object to a support structure, which assembly is comprised of a bracket including a flat fixing plate portion having at least one straight side and a flange portion extending from said one side of the fixing plate portion to stand outwardly of one face of the fixing plate portion at said one side of the fixing plate portion, and a powder actuable fastener stud having a head, a shank and a tip, wherein the bracket further comprises a stud holding portion formed integrally with the fixing plate portion to project outwardly of said one face of the fixing plate portion and defining an aperture with which the shank of the stud is engaged with a friction fit whereby the stud is held with its shank perpendicular to the fixing plate portion and its head spaced outwardly from said one face of the fixing plate portion so that, on actuation of the fastener stud, the stud head will engage the stud holding portion of the bracket which is formed to yield under the impact of that engagement, whereby the stud can be driven by powder actuation into a flat support surface to hold the fixing plate portion flat against that surface and so anchor the flange portion in a position in which it extends out from the support surface beyond the fixing plate portion and the stud head.

2. A fastener assembly as claimed in claim 1, wherein the fastener stud is held by the stud holding

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portion of the bracket such that its tip is generally flush with the face of the fixing plate portion of the bracket opposite to said one face.

3. A fastener assembly as claimed in claim 1 or claim 2, wherein the stud holding portion of the bracket is in the form of a generally cylindrical collar pressed out of the fixing plate portion of the bracket so as to extend perpendicularly from it.

4. A fastener assembly as claimed in claim 3, wherein said collar yields on impact with the stud head by splaying outwardly to form a bead or rim between the stud head and the fixing plate portion of the bracket.

5. A fastener assembly as claimed in claim 1 or claim 2, wherein the stud holding portion of the bracket is formed as a dished or bowed plate portion with the aperture extending through it at the apex of the dish or bow so as to grip the stud shank at a position spaced outwardly from said one face of the fixing plate portion, the dished or bowed plate part collapsing on impact with the stud head.

6. A fastener assembly as claimed in claim 5, wherein the stud holding portion of the bracket comprises a U-shaped strip raised out of the fixing plate portion of the bracket.

7. A fastener assembly as claimed in any one

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of the preceding claims, further comprising a sleeve disposed about the shank of the stud between the stud head and the fixing plate portion of the bracket, said sleeve being arranged such that the periphery thereof frictionally cooperates, in use of the fastener, with the barrel bore of an explosively powered tool to retain the stud in the barrel bore prior to actuation of the tool.

8. A fastener assembly as claimed in claim 7, wherein said sleeve is formed to disintegrate on actuation of the fastener stud.

9. A fastener assembly as claimed in any one of the preceding claims, wherein the fixing plate and flange portions of the bracket are both rectangular and are perpendicular to one another so that the bracket is in the form of an angle clip.

10. A fastener assembly as claimed in any one of claims 1 to 8, wherein the bracket is in the form of a conduit clip, the flange and fixing plate portions being perpendicular at their junction and the flange portion being curved outwardly from said junction to form a hook extending away from the fixing plate portion.

11. A fastener assembly substantially as hereinbefore described with reference to Figures 1 to 3 or with reference to Figures 1 to 3 as modified by Figure 4 of the accompanying drawings.

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12. A fastener assembly substantially as
hereinbefore described with reference to
Figures 5 to 7 or with reference to Figures 5 to
7 as modified by Figure 8 of the accompanying drawings.

DATED this 30th day of MAY, 1977

RAMSET FASTENERS (AUST.) PTY. LTD.

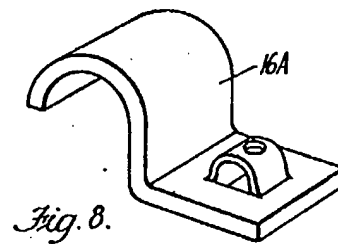
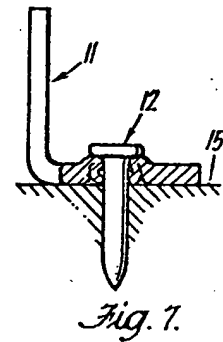
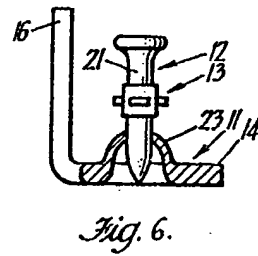
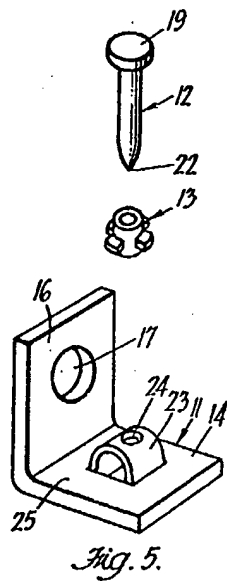
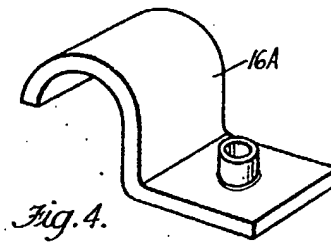
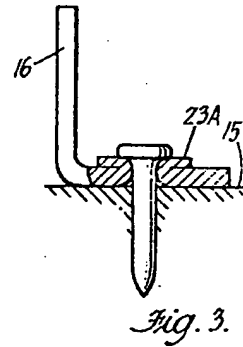
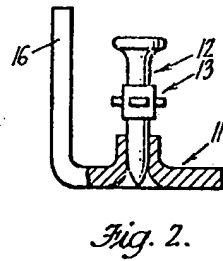
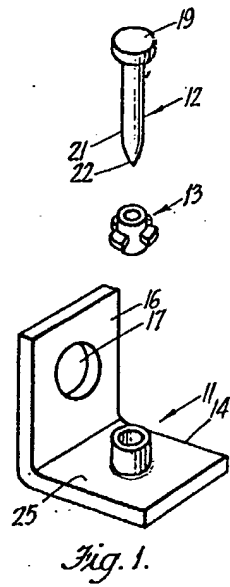
By its Patent Attorneys:

DAVIES & COLLISON



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